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Complexation of nuclear magnetic resonance and x-ray computed tomography methods for the qualitative assessment of the whole core porosity

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Abstract

© SGEM2018. The purpose of the research is determination and comparison of the porosity values of the whole core obtained by nuclear magnetic resonance (NMR) and X-ray computed tomography (CT) methods. To achieve the purpose of the research, it was necessary to solve the following tasks: a) measurement of porosity of a whole core by NMR; b) obtaining core porosity values using X-ray CT; c) comparison of the obtained values, explanation of the differences in the porosity using these two methods; d) proposal of new approaches in the interpretation of data obtained using NMR and X-ray CT methods. After the measurements using NMR-tool, the resulting free-induction decays of protons were converted into spectra. The result was the total porosity of the whole core by the NMR method. When interpreting the data of the X-ray CT, a three-dimensional density model of the core was analyzed, this made it possible to reveal the pores inside the core sample. As a result, the total porosity of the X-ray CT data was greatly underestimated compared to the NMR method. This is explained by the low resolution of the images obtained for the whole core In this paper, we present the results of comparing the total porosity obtained by the NMR and X-ray CT method using the author's method of interpreting images. Another result of the study is the conclusion that it is possible to use the data of the X-ray CT to refine the position of the T2 cut-off based on the analysis of the NMR and X-ray CT signal spectra. The refinement of this cut-off makes it possible to more accurately determine the effective porosity of the core.

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Keywords

NMR, Porosity, T2 cut-off, Whole core, X-Ray CT

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